

## **Watching the Blue Planet from Space over Recent Decades: What's up for Science and Society?**

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Since the first photographs of “Earth Rise” taken by the Apollo astronauts in the 1960s galvanized the environmental movement, imaging of our planet from low Earth orbit has grown more sophisticated and diverse. Satellite and astronaut observations and imagery of the changing ocean still have the power to galvanize oceanographers and society. So what are some of the key ideas for oceanography and society that come out of our recent decades of ocean observation from space?

Satellite oceanography has made fundamental contributions to our understanding and estimation of changing sea level, winds and storminess over the oceans, primary productivity of the seas, the role of the ocean in the water cycle, and the changes in the ocean known as ocean acidification. Some of these phenomena interact in complex ways and Mother Nature hides the future well. However, some things are clear.

Sea level rise has been monitored from space for more than 20 years and now we have a more nuanced understanding of regional variation in sea level rise and the contributions of ocean thermal expansion and the melting of glaciers and ice sheets.

Wind vectors at the ocean surface have been measured for more than 2 decades and provide evidence for shifts in wind patterns that help, for example, explain some of the regional variations in sea level rise.

Chlorophyll-a has been estimated in a multi-decadal record of observations and is being used to describe the shifts and trends in ocean primary productivity.

Sea surface temperature estimation from space has records going back to the 1970s and provides critical information for the interaction of the ocean with the atmosphere.

Sea surface salinity has been measured from space only within the last decade and provides a novel new view of regional, seasonal, and interannual changes in the ocean related to precipitation, river run-off, and eddy transport. Potential changes in the Earth's water cycle have a huge societal impact.